

At PPPL
THIS WEEK

MONDAY, SEPT. 30 - OCT. 4

66th Annual Gaseous Electronics Conference
Westin Hotel, Princeton

WEDNESDAY, OCTOBER 2

PPPL Colloquium
4:15 p.m. ♦ MBG Auditorium
The Power of Neuroplasticity: Enhancing Human Potential
Paula Tallal, Rutgers University

THURSDAY, OCTOBER 3

Theory Seminar
10:30 a.m. ♦ MBG Auditorium
Rotating instabilities in low temperature magnetized plasmas
J.P. Boeuf - LAPLACE, CNRS, University of Toulouse, France

FRIDAY, OCTOBER 4

Red Cross Blood Drive
8 a.m. - 1 p.m. • Lower N Parking Lot

UPCOMING EVENTS

October 11-12
Freshman Parents Tour
Princeton University Freshman Families Weekend tours of PPPL

October 19-20
Lyman Spitzer Conference
Dept. of Astrophysical Sciences
Peyton Hall, Princeton University

October 21
Open Enrollment Begins

October 25
Boy Scout Merit Badge Fair

November 6
Health Fair at PPPL

November 11 - 15
55th Annual Meeting of the APS Division of Plasma Physics
Denver, Colo.

INSIDE...



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Together at last: PPPL binds the heart of the NSTX-U into a complete whole

By John Greenwald

After some 18 months of painstaking preparation, PPPL bound all 36 magnetic field conductors for the center stack of the National Spherical Torus Experiment Upgrade (NSTX-U) into a unified whole last week. Engineers and technicians lifted the lid of the mold for the latest crucial stage of the process and found that the task of combining all four quadrants of 20-foot-long conductors into one nearly 20,000-pound cylindrical bundle had gone smoothly as planned.

The bundle will now undergo key electrical tests to ensure that the insulation between the conductors provides enough resistance to keep the current in each one separate. Engineers stressed that the bundle must pass these tests before its construction can be deemed a complete success. The bundle lies at the heart of the upgrade, which will double the power of the NSTX-U when the overhaul is

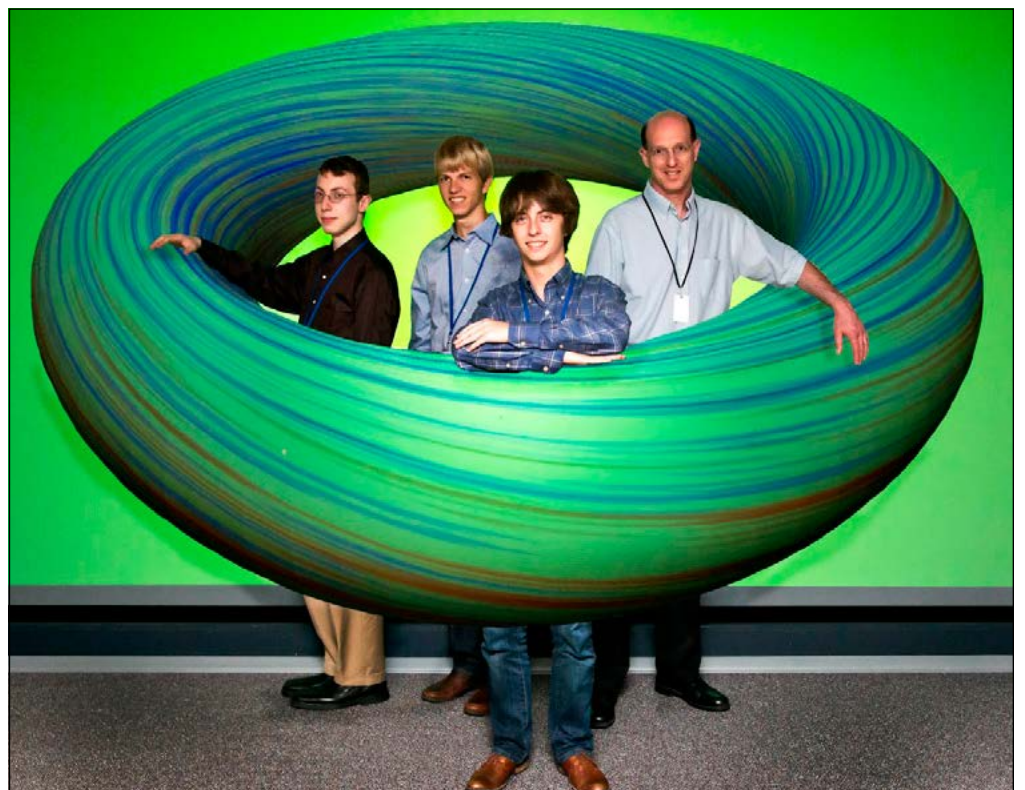
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3-D plasmas are part of the fun as Feibush's interns unleash their creativity

By Constance Kaita

For more than a decade, computational scientist Eliot Feibush has been a mentor and teacher to dozens of student interns – guiding them in projects that give them first-hand experience in computer graphics and showing them how to develop programs that make sense of the scientific data from PPPL's plasma

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Feibush and his three students in the Science Education summer internship program had some fun with a giant 3-D image of a plasma with the help of PPPL photographer Elle Starkman. Feibush's student Matthew Lotocki, with Feibush and the other students, created a new program that can give a full 3-D picture of a torus. Photo illustration by Elle Starkman. From left to right: Jared Miller, a freshman at Northeastern University in Boston; Lotocki, Princeton University; and Michael Knyszek, University of California, Berkeley; and Feibush.

Center Stack

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completed in fall, 2014. The increased power will enable PPPL scientists to investigate the behavior of plasma, the hot, electrically charged gas that fuels fusion reactions, under higher temperature and magnetic field conditions, and for longer periods of time, than previously had been possible.

Final step

The final step of the bundle's construction provoked some anxiety as workers prepared to open the mold used to join the quadrants of fiberglass-wrapped copper conductors together through what could be a volatile process known as vacuum pressure impregnation (VPI). The procedure called for workers led by technician Buddy Kearns to inject liquid epoxy into the mold and gradually heat it to 170 degrees centigrade — or 330 degrees Fahrenheit — to seal and insulate the conductors.

The results could be unpredictable. "There are two main causes of concern in this process," said engineer Steve Raftopolous, who co-directed the overall construction of the bundle with Chrzanowski. "You want the mold to be fully filled and you want the epoxy to make it through the VPI without leaking or overheating."

The VPI took a week as technicians raised the temperature in a carefully controlled sequence designed to ensure that the epoxy cured to full strength while minimizing the risk of mishaps. "Patience is a virtue in this type of work," said Chrzanowski. "There's been such an investment in the bundle up to this point that you want to make sure that nothing goes wrong."

Plenty of practice

His team of engineers and some dozen technicians has had plenty of practice. Each of the four quadrants that make up the bundle underwent its own VPI process. "You can never take these VPIs for granted," Chrzanowski said. "Each one has its own personality."

Completing these tasks has been a major achievement. "One reason this went so well is that we benefitted from lessons learned from the last four VPIs," Ron Strykowski, head of the overall NSTX-U project, said of the bundle operation. "This was a true team effort."

Strykowski pointed with pride to an outside evaluation of PPPL's fabrication of the magnetic conductors. The report from the National High Magnet Field Laboratory in Florida found that PPPL "is using the latest best business, technical and quality practices, and that the team is eager and capable of finishing the project within the present schedule predictions."

"Of course, we knew this all the time," Strykowski said, "but it's nice to hear our peers recognize the talents and dedication of our people."



A view through the bore of a device in the ohmic heating winding station.



The fiberglass-wrapped bundle in the bottom half of the mold before the VPI. Left row front to back: Mike Viola, Jim Chrzanowski, Andy Carpe, Kris Gilton, Steve Bartzak, Buddy Kearns. Right row front to back: Steve Raftopolous, Doug Westover, Jim Smith, Jim Benchoff, Larry Dudek, Colin McFarlane, Bob Tucker.

Construction of the NSTX-U center stack now heads into the home stretch. Still another VPI process will take place early next year when technicians wind an ohmic heating coil — a part that will add heat and put an electric current into the plasma — around the bundle of conductors.

Technicians working under the supervision of NSTX-U construction manager Erik Perry will finish assembly of the center stack by installing the bundle into a case made of inconel — a nickel-chromium-based alloy more heat-resistant than stainless steel. They will then set the stack inside the NSTX-U and connect the unit to water lines, vacuum seals and external magnetic coils in preparation for the start of plasma experiments late next year.



The full bundle of conductors inside the mold. (Photo by Jim Chrzanowski).

more photos on page 3

Center Stack

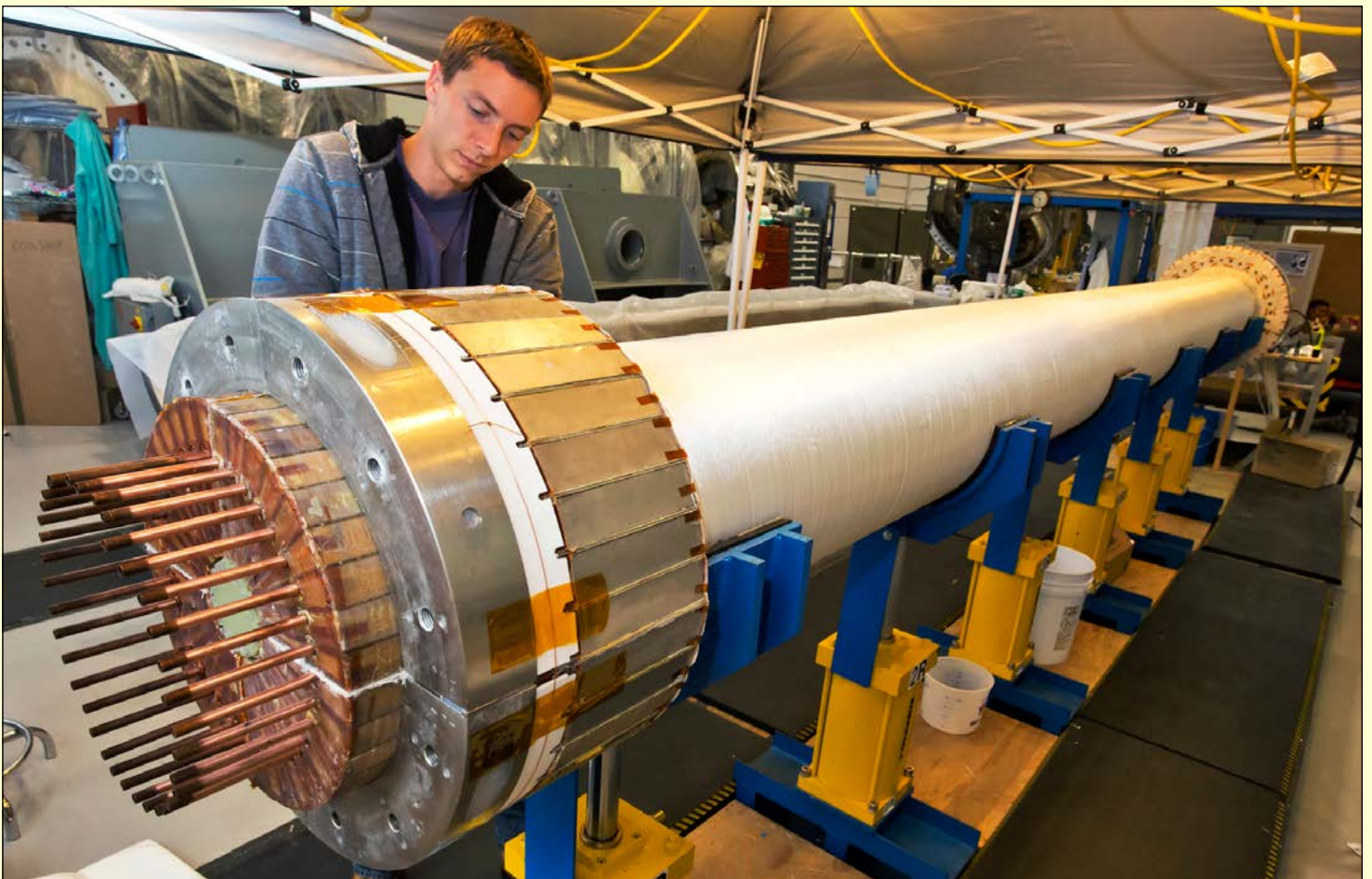
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Technicians prepare to lower the taped bundle of coils into the mold.



The center stack casing.



Technician Steve Bartzak works at the fiberglass taping station.

Feibush

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experiments. During Feibush's 12 years at PPPL he has taught dozens of high school students and undergraduates the ins and outs of analyzing and visualizing research data. He received the DOE's Outstanding Mentor Award in 2010.

Students do "amazing things"

Feibush's students have gone on to study at some of the top graduate programs in the country, work for corporations like Google, and develop their own successful start-up companies. "He has this continual record of year after year, his students going off to do these amazing things," said Andrew Zwicker, head of Science Education. "You get to a point where it's too much of a coincidence for him not to be a significant influence in what they do next."

Feibush's ability to tailor projects to each student's interest is one thing that makes him an outstanding mentor, Zwicker said. "He chooses excellent projects because they're both challenging and interesting," he said.

Students came back to PPPL in the summer

Feibush recently mentored three students who graduated from Bergen County Academies. Michael Knyszek, Matt Lotocki, and Jared Miller had worked with him throughout the academic year in a weekly internship and came back to PPPL in the summer, working as full-time summer students before starting college.

"He strikes a good balance between helping us out when we need help and letting us do our own thing," Lotocki said. "He doesn't hold our hands but he helps us when we need it."

Lotocki previously had experience on ray-tracing programs, which develop algorithms for doing realistic renderings of 3-dimensional objects by experimenting with simulations of lighting and shading.

At PPPL, he worked on a project that traced the trajectory of an ion within a 3-dimensional volume. It is difficult to draw the path of an ion because the trajectory must be projected onto a 2-dimensional screen. Lotocki worked on a project to render the shadow of the particle's trajectory onto the plane of a 3-dimensional box so that the observer would be able to tell immediately where it is moving.

Software programs for the Science Bowl

Sometimes Feibush is able to introduce his own interests into projects. Feibush has been fascinated by science bowls since he watched the College Quiz Bowl on TV with his father as a child and has worked on several software programs for the regional U.S. DOE Science Bowl®, hosted annually by PPPL. (See article, "A High Tech Science Bowl.") In 2013, he and his students worked on software to eliminate the need for organizers to write the results and room assignments by hand.

Miller, who is interested in graphics, worked on the JavaScript program for transforming the archaic handwritten scoreboard into a computerized bracket display that could be updated virtually from computers and smart phones anywhere in the building. "It was a great



Feibush and his three former interns at Bergen County Academies, after the students gave their final internship presentation last spring. Feibush, far right, is holding a certificate he received for being their mentor. His students from left to right are: Michael Knyszek, Matthew Lotocki and Jared Miller. (Photo by Bergen County Academies student Marina Solis).

project for everyone," he said. "It dramatically improved the way the whole Science Bowl ran."

Feibush's commitment to each student has not gone unnoticed. "He provides just the right amount of supervision and guidance," Zwicker said. "He allows his students to be creative where necessary yet rigorous in their code work."

Feibush and his students are working on an ongoing project to improve ELVis, one of the scientific graphics programs he has developed for PPPL. It is particularly important for studying data that evolves over time, such as the continuously changing behavior of plasma. ELVis creates high-definition animations of plasma simulations based on 3-dimensional graphs that depict the changes over particular increments of time. Since its inception in 2003, the program has been updated several times. Feibush launched the latest version this summer.

Keeping up with a changing field

Programs like ELVis require continuous development because the field of computer graphics is constantly advancing. Feibush said his young apprentices are plugged into the constantly evolving technology and can suggest new approaches to challenges such as updating ELVis. "I learn from them, too," he said. "They are always interested in trying out new things and investigating the latest software packages and techniques." Students often suggest new approaches to meeting the next challenge.

Feibush said he learned his mentoring skills from the professor who supervised him as an undergraduate studying computer graphics at Cornell University. He applies some of the approaches he learned as a student himself to his own teaching. "For one thing, I never tell them how hard something is or they'll give up," he said. "I present it to them as a problem to be solved so they might just go off and come up with a solution."

Through his strong dedication to both his field and his students, Eliot Feibush is cultivating the next generation of scientists working toward PPPL's vision. "The day-to-day stuff is challenging," Feibush said, "but the long term results are extremely worthwhile." 📧

New Tile Logo

Yes, you can walk on it!



Mike Viola demonstrates that it's OK to step on the PPPL logo on display on the floor outside the cafeteria. It took six months and lots of effort but the tiles were finally installed early last week. The tiles were custom made by Tile Mural Creative Arts in California and were shipped from Spain. The orange logo is baked into the 5-foot by 6-foot display so there's no need to tiptoe around the display since the colors won't wear off with foot traffic. So go ahead, walk on it! The trio who worked on the tile display pictured above are, from left: Viola, head of Facilities and Site Services; Ed Jenkins, contract technical representative; and graphic designer Greg Czechowicz.

PPPL involved in new "Lift Off to Mars" STEM program



Andrew Zwicker, head of Science Education, shows off a toy rocket created by a 3-D printer during the kick-off for a new pilot STEM program entitled "Lift Off to Mars," at the Newtown Friends School in Newtown, Pa. The program will show eighth grade students how to use science, technology, engineering and math to figure out how to get to Mars. It is supported by PPPL and scientists from Enterra Solutions LLC, Lockheed Martin, Bristol Meyer Squibb Corp. as well as local business leaders.

A message from HR:

Two new health programs for benefits eligible staff

Two new health programs, My Health Coach and My Medical Expert, will be available free for benefits eligible staff starting Sept. 30.

MY HEALTH COACH, offered in partnership with TrestleTree, an accredited health transformation organization, provides you and your eligible dependents with free confidential assistance to achieve your health goals. To make an appointment with a Health Coach, call TrestleTree at 866-237-0973.

MY MEDICAL EXPERT, offered in partnership with Best Doctors, a firm recognized for identifying expert physicians to bring best practice medicine to you, is confidential, offered at no cost to you, and designed to help you make medical decisions with greater confidence. You may contact Best Doctors at 866-904-0901 or visit members.bestdoctors.com.

Also, join us at PPPL's Health Fair on Nov. 6 at 11 a.m. in the MGB Auditorium for a presentation on these two new programs. Representatives from My Health Coach and My Medical Expert will also be available from 10 a.m. to 2 p.m. in the lobby to answer your questions. ☺



Help Wanted:

Freshman Family Tours Oct. 12 at 2 p.m. and 3 p.m.

PPPL is hosting two tours of up to 100 Princeton University freshman students and their families on Saturday, Oct. 12, at 2 p.m. and 3 p.m. as part of Princeton's Freshman Family Weekend.

If you're an experienced tour guide and can help out with one of the tours, please contact Jeanne Jackson DeVoe, jjackson@pppl.gov. Thank you!



COLLOQUIUM



The Power of Neuroplasticity: Enhancing Human Potential

PAULA TALLAL
Rutgers University

Wednesday, October 2

4:15 p.m. (Coffee/Tea at 4 p.m.) • MBG Auditorium

HELP SAVE A LIFE + DONATE BLOOD



**American
Red Cross**

Princeton Plasma Physics Laboratory
American Red Cross Blood Drive

Friday, October 4

8 a.m. - 1 p.m. • Lower End Parking Lot

Call Tricia Berran x3200 for an appointment
or sign up online at www.redcross.org

Enter sponsor code: PPPLPrinceton



Get Your Flu Shots Now



Flu vaccine appointments
are now available at PPPL.
Please contact the OMO at
extension 3200 or email
omo@pppl.gov for an ap-
pointment.

The vaccine is available to
regular employees, grad
students and DOE.

Free Open House T-shirts

There are a limited number of free PPPL
Open House T-shirts available in plus sizes
(2XL and 3XL). Please contact John De-
Looper (jdelooper@pppl.gov) if you would
like one.



Brock Café at PPPL Menu

BREAKFAST 7 a.m. • 10 a.m.
CONTINENTAL BREAKFAST 10 a.m. • 11:30 a.m.
LUNCH 11:30 a.m. • 1:30 p.m.
SNACK SERVICE until 2:30 p.m.

— MARK GAZO, Chef Manager

COMMAND PERFORMANCE
CHEF'S FEATURE

MON. 30
SEPT.



BEEF STROGANOFF

Oatmeal Raisin Pancakes
with Turkey Sausage

Beef Barley

Veggie Burger with Mushrooms
& Pepperjack Cheese

GRILLE
SPECIAL

Popcorn Shrimp Caesar Wrap

DELI
SPECIAL

Chicken Breast with
Roasted Peppers

PANINI

½ Sandwich, Small Soup or
Salad, Chips, 12 oz. Soda

TUE. 1
OCT.



ROAST PORK

2 Eggs any style, Choice of
Meat, Potatoes and 2 Toast

Chicken Rice

Rotisserie Style
Chicken Wings with Fries

Portobello Mushroom with
Spinach & Pepperjack

Cajun Chicken, Cheddar, Red
Onion, Tomato & Cajun Mayo

2 Slices Pizza, Bag of Chips,
12 oz. Soda

WED. 2
OCT.



BAKED ITALIAN BREADED CHICKEN

Blueberry Pancakes
with Sausage

Minestrone

Kielbasa & Kraut Torpedo

Roast Beef, Swiss Cheese &
Bacon on a Kaiser Roll

Chicken Cordon Bleu Sandwich
served with Potato Salad

Cheeseburger, French Fries,
12 oz. Soda

THU. 3
OCT.



BAKED POTATO BAR

Sausage, Egg, Cheese, Onion &
Pepper Quesadilla

New England Clam Chowder

French Dip au Jus served with
Potato Wedges

Turkey Cobb Wrap with Bacon,
Avocado & Blue Cheese

Cuban Panini

2 Hot Dogs, French Fries,
12 oz. Soda

FRI. 4
OCT.



CARVED TURKEY

Peanut Butter Pancakes with
Bacon

Split Pea

Jersey Devil Cheeseburger

Chicken Salad & Bacon Club
Sandwich

Italian Hot Dog

Meatball Sandwich, Potato
Chips, 12 oz. Soda

MENU SUBJECT TO CHANGE WITHOUT NOTICE

VEGETARIAN OPTION

[CLICK HERE FOR A PRINTABLE WEEKLY MENU](#)

WEEKLY

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